



Third United Nations
International Conference
on the Peaceful Uses
of Atomic Energy

A/CONF.28/A/376

USSR

February 1964

Original: RUSSIAN

Confidential until official release during Conference

Abstract

COMPENSATION OF LARGE CHANGES IN THE REACTIVITY BY
DEFORMATION OF THE CORE LATTICE

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Prolongation of the power reactor life entails the increase in the reactivity margin of the newly loaded reactor and, therefore, calls for the development of an effective system compensating for this margin. Along with the conventional systems such as the shim rods and assemblies, burnable poisons, mixtures of heavy and light water, it is deemed advisable to discuss the possibility of controlling the reactivity by means of a relatively slow deformation (variation of the effective spacing) of the core lattice in the moderator. This is most **feasible** in the case of liquid-moderated reactors with channel type cores (the type of the core employed in the reactors of the icebreaker LENIN). Deformation of the lattice is, in a sense, similar to controlling the reactivity by changing the concentration of the heavy and light water mixture, in that its effect does not cause considerable distortions of the energy release field corresponding to the insertion of the permissible number of the absorbing rods. However the flexibility of the suggested method is rather high. The difficulties involved in the development of such control systems are due to the necessity to have a considerable number of kinematic pairs in inaccessible points of the reactor, to arrange "light" but quick-acting control and safety components in the movable lattice and to adapt the system to operation at a varying temperature effect.

The work on the development of the new control system was

carried out along three main lines: critical experiments, mathematical description (including calculation codes for high-speed computers), designing of the core.

Several series of critical experiments confirmed the effectiveness of this method of control and made it possible to find out its physical peculiarities and work out simple but sufficiently accurate computer codes. The experiments were carried out with individual fuel elements and with bundles - channels.

The paper describes several design schemes of cores with deformable lattice.